Chemical and Microbiological Test Results of Sound-Sorb Berm at the Orillia Gun Club, Orillia, Ontario

Ministry of the Environment

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Introduction

Atlantic Packaging Ltd. is a paper recycling company. Wastewater produced at the plant during the paper-making process contains suspended solids consisting of clay and short paper fibres. Subsequent de-watering leaves a paper fibre biosolid waste, which is used by Courtice Auto Wreckers Ltd. to produce a material called Sound-Sorb. Sound-Sorb is produced by mixing the paper fibre waste with mineral soil. Sound-Sorb is currently being used to construct sound and bullet attenuation berms at gun clubs in Ontario.

The public has expressed concern that berms built of Sound-Sorb will adversely affect human and environmental health. In response, the ministry tested the Atlantic Packaging paper fibre biosolids and the Sound-Sorb material for over 90 different elements and compounds. A report describing the results of this testing was completed in June, 2002. With the exception of total petroleum hydrocarbons (TPH), toluene, free cyanide and chloride, all parameters measured were present in concentrations lower than those found in soils in Ontario that have not been subject to contamination by commercial or industrial activity (Table F. *Guideline for Use at Contaminated Sites in Ontario).* Only TPH was found in the berm at a level which would prompt remedial action if the soil on the site contained a similar TPH concentration and the site were to be redeveloped. The risks to human and environmental health associated with the TPH levels in the berm are currently being addressed in a Site Specific Risk Assessment (SSRA). In addition to the SSRA, other work currently under way to address recommendations made in the June, 2002 report, include well monitoring and further testing of the Sound-Sorb material. A study that assessed the potential for the berm to generate aerosols containing harmful bacterial and fungal spores has recently been completed and a panel of scientific experts to review all existing and new scientific information has been established.

To supplement the testing of the berm at the Oshawa Skeet and Gun Club, and to look at how the chemical composition of Sound-Sorb berms varies across the province, berms at other locations were also tested. The Ministry of the Environment (MOE) reported test results for the berm at the East Elgin Sportsman's Association in early 2003. In the summer of 2003, the Madoc and District Anglers and Hunters (MDAH) site and the Orillia Gun Club were selected and sampled. This report summarizes the test results for the Orillia Gun Club.

Sampling and Analysis

On July 31, 2003, MOE York-Durham District Office staff sampled four Sound-Sorb berms at the Orillia Gun Club in Orillia, Ontario. The berms sampled have all been in place since April 2000. Core samples were taken from each berm using an AMS extendible soil core sampler with 40 cm length polycarbonate tube inserts. The insert allowed removal of an intact section which was sectioned and transferred to laboratory containers and submitted to the ministry's Laboratory Services Branch for analysis.

The samples from the Orillia Gun Club were tested for similar chemical elements and compounds as were measured in the fresh paper fibre biosolids and the Sound-Sorb berm located at the Oshawa Skeet and Gun Club. A description of each of these parameters is outlined in the MOE June 2002 report, *Atlantic Packaging Ltd. Paper Fibre Biosolids and Sound-Sorb Berm, Oshawa Skeet and Gun Club: Results of Chemical and Microbiological Testing*. The samples were also tested for chlorophenol compounds at the request of concerned citizens.

Use of Guideline Data for Comparison

The contaminant concentrations listed in two tables from the *Guideline for Use at Contaminated Sites in Ontario (1997)* were used for comparison with the results. Table F lists the upper range of contaminant concentrations found naturally in soils (0 - 5 cm depth) in Ontario, from areas that have not been subjected to contamination from commercial or industrial activity.

Table A lists the upper limit concentrations of contaminants in soil that would prompt remedial action if the land were to be redeveloped for recreational/residential purposes, in an area where the groundwater is used for human consumption. Table A concentrations have been developed to provide protection against the potential for adverse effects to human health, ecological health and the natural environment (Ontario Ministry of Environment and Energy, 1997). The intended use of these guidelines is for measuring soil contamination by a foreign material deposited on the site. The guidelines are not routinely used for comparison with the chemical concentrations of the foreign material itself. For this reason, the comparisons made in this report are for information purposes only. If contaminant levels in the berm exceed the criteria in these tables, the environmental and human health risk associated with these contaminants will be assessed.

Discussion of Analytical Results

Results of the analyses are presented in Tables 1, 2 and 3 attached. Table 4 presents the inorganic chemistry data for the Sound-Sorb berm at Orillia, as it compares to data collected from the Sound-Sorb berms at the Oshawa Skeet and Gun Club (Oshawa, Ontario), the East Elgin Sportsman's Association (Alymer, Ontario) and the Madoc and District Anglers and Hunters (Madoc, Ontario) .

E. coli (fecal indicator) bacteria were not detected in the Orillia berm cores. These findings are similar to those at the Oshawa Skeet and Gun Club, the East Elgin Sportsman's Association and the Madoc and District Anglers and Hunters sites. Coliform bacteria, the group of bacteria into which *E. coli* falls, are naturally present in large amounts in surface soils and are also present in large amounts in fresh paper fibre biosolids (Ontario Ministry of the Environment and Energy, 2002). The fact that *E. coli* were not detected in the berm samples, or were present at trace amounts in some berms, suggest that they die off rapidly after berm construction. In the June 2002 report it was suggested that this may be a result of nitrogen deficiency and the heat generated through composting processes occurring in the berm.

As with the berms located at the Oshawa Skeet and Gun Club (see June 2002 report), the East Elgin Sportsman's Association (see January 2003 report) and the Madoc and District Anglers and Hunters (see November 2003 report) sites, the inorganic chemistry sample results from the

Orillia berm cores are within the typical range of uncontaminated Ontario soils. (Table F, of the *Guideline for Use at Contaminated Sites in Ontario, 1997*).

Table F, of the *Guideline for Use at Contaminated Sites in Ontario*, does not include limits for elements such as aluminum, calcium, magnesium, sodium, potassium, iron, and others. These elements form the basic building blocks of soil minerals and are present in varying amounts in soils. As such, they are not considered contaminants. However, as part of the soil survey conducted during the preparation of MOE's *Guideline for Use at Contaminated Sites in Ontario*, these elements were measured. The upper limit concentration of each of these elements found in uncontaminated Ontario soils is shown in the attached table, so that the reader may compare them to the concentration of these elements that were found in Sound-Sorb. With the exception of calcium and strontium, elements were below the upper expected concentrations. Calcium and strontium are unique, however, in that soils derived from limestone can have naturally occurring concentrations much higher than the guideline levels provided in the attached table. Elements for which this upper limit concentration is used, are flagged in the attached Table 1 by ** in the column labeled Table F. For details on the calculation of the upper limit values, please consult the June 2002 report.

Chlorophenol compounds were not detected in the Orillia Gun Club berm samples.

As found in other berms tested, the total petroleum hydrocarbons (TPH) in the Orillia berm cores exceeded the Table A concentration of 1100 ug/g (parts per million) (*Guideline for Use at Contaminated Sites in Ontario, February 1997*). The hydrocarbons detected were comprised primarily of compounds in the C10 to C50 range (i.e. compounds having between 10 and 50 carbon atoms). The berms that have been sampled to date are of varying ages. From oldest to newest, the berms list as follows: Orillia Gun Club, Oshawa Skeet and Gun Club, MDAH, East Elgin Sportsman's Association. The TPH levels found at Orillia were between 2,750 and 4,910 µg/g. These levels are comparable to those found at the Oshawa Skeet and Gun Club (3,400 µg/g) and lower than those found at the East Elgin Sportsman's Association (7,600 - 11,000 µg/g) and at the Madoc and District Anglers and Hunters site (7,930 - 9,670 µg/g). It is possible that as the berms age, natural bioremediation of the hydrocarbons occurs.

An assessment of the risks posed to human and ecological health by the petroleum hydrocarbons found in Sound-Sorb is being conducted. This assessment will also consider other compounds such as acrylamide monomer and *E. coli*, as these have been raised as a concern by the public. This information will serve as a basis for determining if remedial measures must be implemented for the protection of human health or the environment.

Similar to the results of samples taken from the East Elgin Sportsman's Association and the Madoc and District Anglers and Hunters site, volatile hydrocarbons such as toluene and xylenes, were not detected in any of the Orillia berm cores. As a result of a provincial power failure that occurred in August 2003, the Orillia samples were not stored at temperatures specified in the ministry's standard operating procedure. Consequently, the ministry's laboratory reported that the results may be biased low. Given that volatile hydrocarbon results for the berms located near

Madoc and Alymer were below method detection limits, the ministry does not feel that it is necessary to resample for these parameters at this time.

The Orillia samples were tested for acrylamide monomer to address concerns raised by the public about its presence as a residual in polyacrylamide which is used as a flocculant in biosolids settling processes at Atlantic Packaging. Acrylamide monomer was not detected in the berm. Previous analysis of the fresh paper fibre biosolids taken from Atlantic Packaging Ltd. (See June 2002 report addendum) detected the presence of 9 µg/g acrylamide monomer. Although guidelines are not available for acrylamide monomer in soil, this low level is not expected to be of environmental or human health concern. As a precaution, however, acrylamide monomer has been included in the human and ecological health site specific risk assessement discussed above.

Polycyclic Aromatic Hydrocarbon (PAH) compound concentrations were below the typical range of uncontaminated soils in Ontario (Table F, *Guideline for Use at Contaminated Sites in Ontario, 1997*). Moreover, all PAH compounds, with the exception of phenanthrene and pyrene, were present either at trace levels or were not detected.

Summary and Conclusions

The differences that were found between the berms in terms of inorganic chemistry, are primarily related to elements such as calcium, aluminum, iron, magnesium, potassium etc. which are mineral-forming elements in soils and as such, are naturally present in soil in varying amounts. Variation between the berms with respect to these elements is therefore expected, given that a different source of mineral soil was used for the construction of each berm.

Organic decomposition processes occur naturally in soil and soil-like materials. Consequently, it was expected that the organic chemical composition of the berm will be reflective of its age. The only organic contaminant present in sufficient quantities to suggest a link between berm age and organic contaminant concentration is TPH. Preliminary data indicate the amount of TPH may be reduced over time through microbial decomposition of the hydrocarbons. Further information on TPH will be provided through the Site Specific Risk Assessment.

Based on the findings at the Orillia site and results reported for the Madoc and District Anglers and Hunters site, the East Elgin Sportsman's Association berms and the Oshawa Skeet and Gun Club, all the Sound-Sorb berms sampled are of similar chemical composition. With the exception of TPH, all parameters measured in the Orillia Gun Club berm were present in concentrations lower than those found in soils in Ontario which have not been contaminated by commercial or industrial activity (Table F. *Guideline for Use at Contaminated Sites in Ontario).* The risks to human and environmental health associated with the TPH levels in Sound-Sorb are currently being addressed in a Site Specific Risk Assessment (SSRA) at the Oshawa Skeet and Gun Club. The results of the SSRA, as well as the results presented in this report, form part of the large body of scientific information which is currently being collected related to Sound-Sorb berms in Ontario. The information will aid the ministry in deciding whether or not there is a need to manage the use of Sound-Sorb within the province.

References:

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